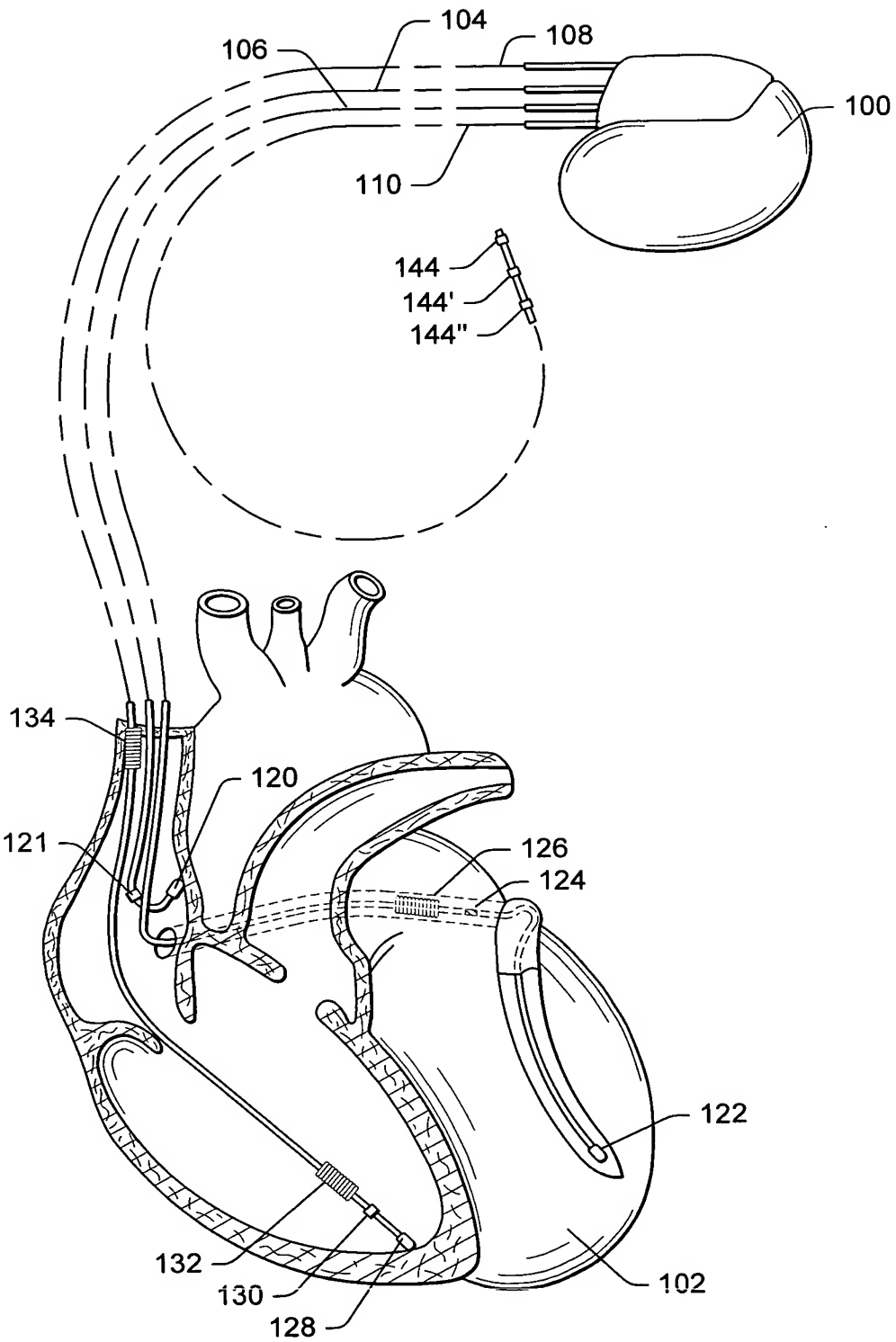
104
106
108
100
110
144
144'
144"
134
120
121
126
124
122
132
130
128
102

Fig.1

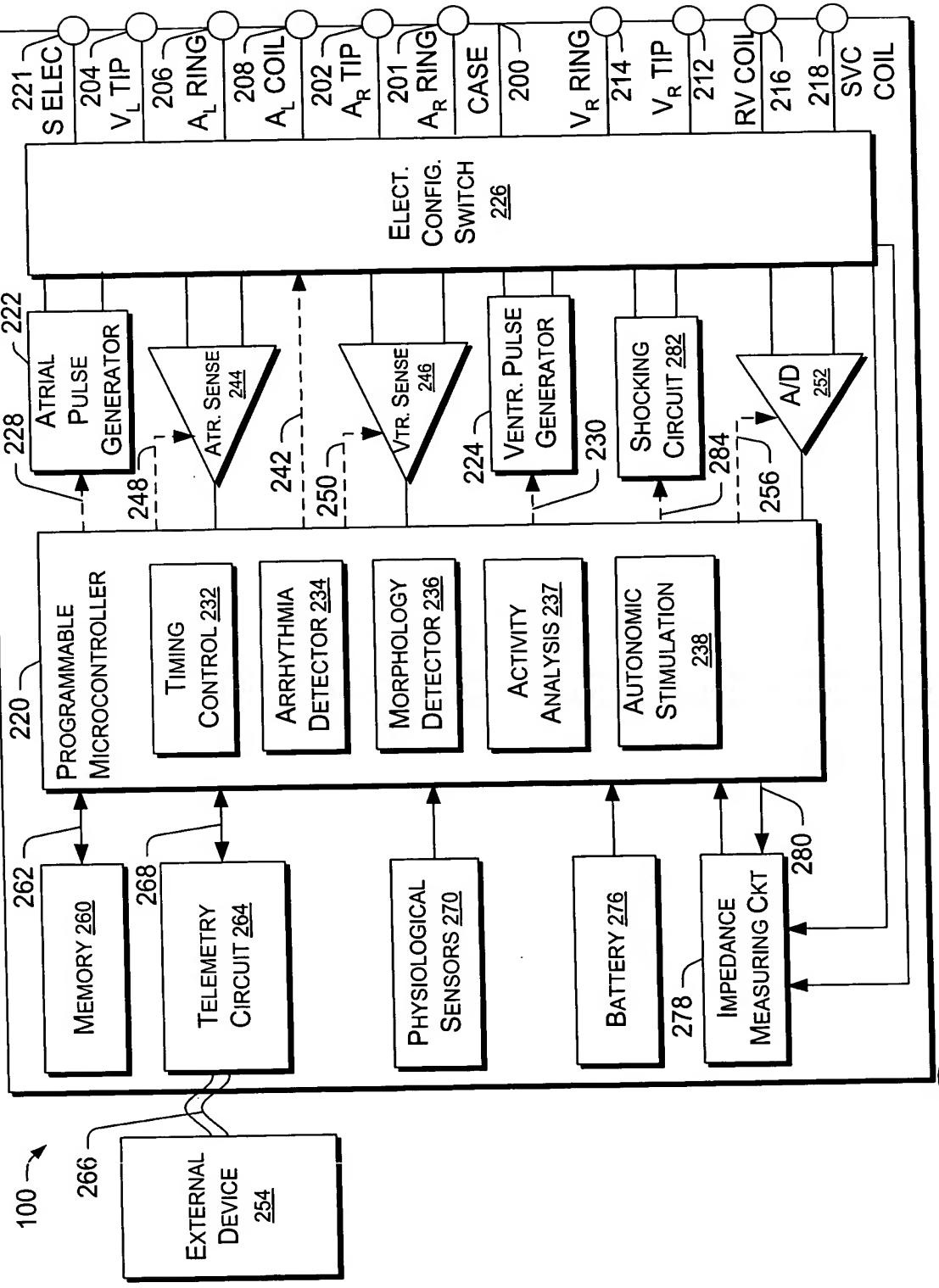
100
266
EXTERNAL DEVICE 254
262
MEMORY 260
268
TELEMETRY CIRCUIT 264
PHYSIOLOGICAL SENSORS 270
BATTERY 276
278
IMPEDANCE MEASURING CKT
280
220
PROGRAMMABLE MICROCONTROLLER
TIMING CONTROL 232
ARRHYTHMIA DETECTOR 234
MORPHOLOGY DETECTOR 236
ACTIVITY ANALYSIS 237
AUTONOMIC STIMULATION 238
228
ATRIAL PULSE GENERATOR
222
248
ATR. SENSE 244
242
250
VTR. SENSE 246
224
VENTR. PULSE GENERATOR
230
SHOCKING CIRCUIT 282
284
256
A/D 252
ELECT. CONFIG. SWITCH 226
221 S ELEC
204 V_L TIP
206 A_L RING
208 A_L COIL
202 A_R TIP
201 A_R RING
CASE 200
V_R RING 214
V_R TIP 212
RV COIL 216
218 SVC COIL

Fig.2

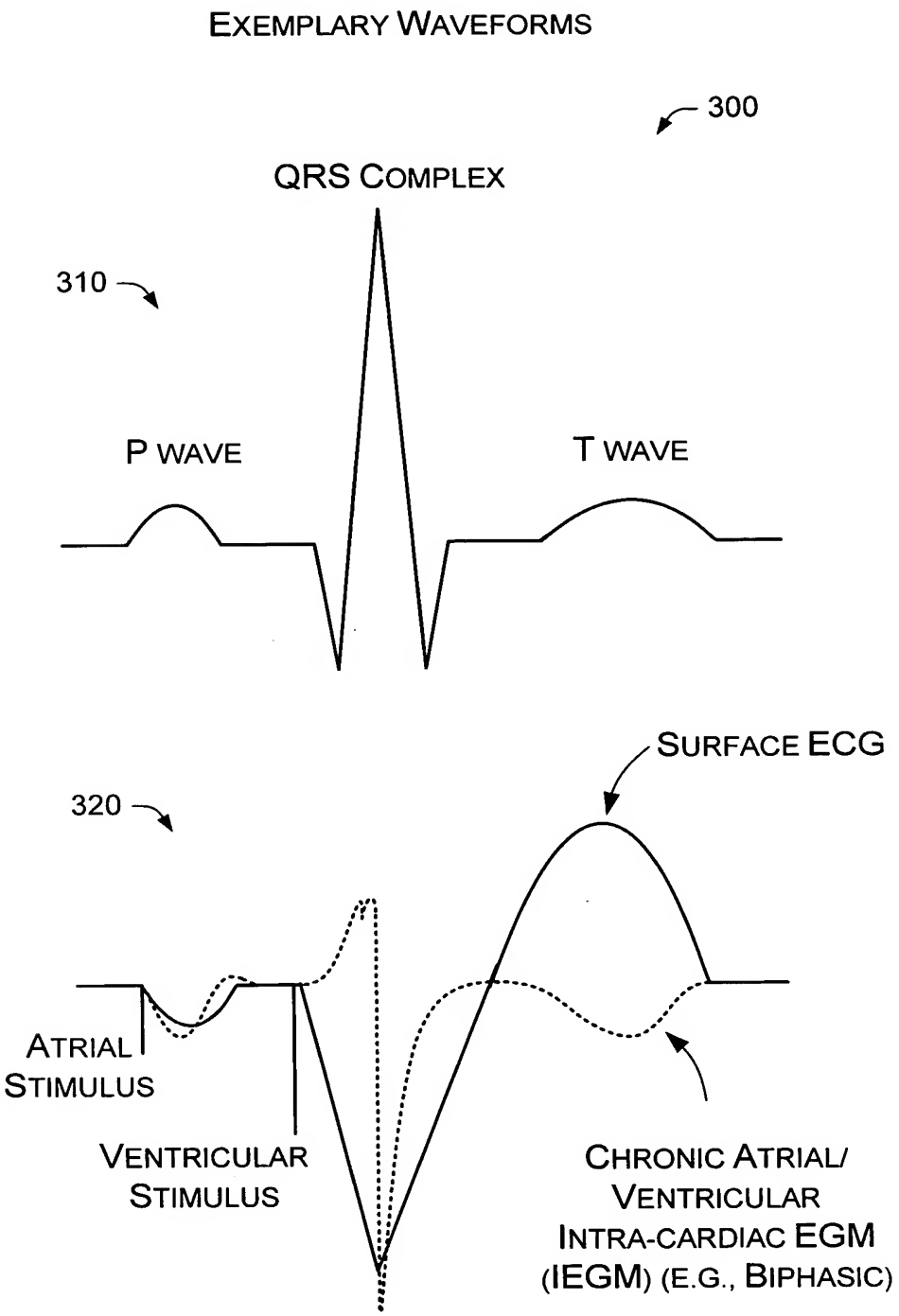
EXEMPLARY WAVEFORMS
300
QRS COMPLEX
310
P WAVE
T WAVE
SURFACE ECG
320
ATRIAL STIMULUS
VENTRICULAR STIMULUS
CHRONIC ATRIAL/ VENTRICULAR INTRA-CARDIAC EGM (IEGM) (E.G., BIPHASIC)

Fig.3

EXEMPLARY WAVEFORMS 400

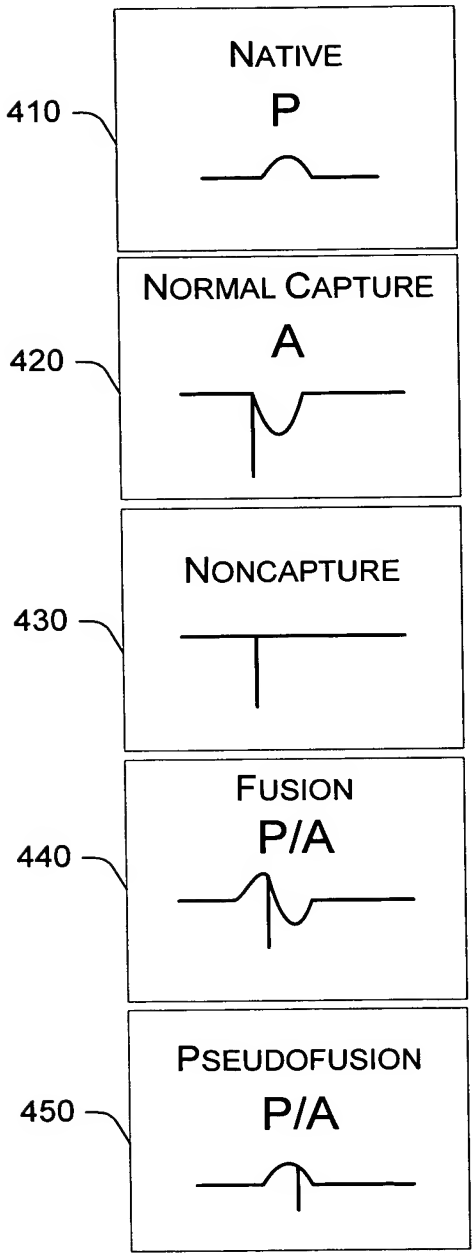

Fig.4

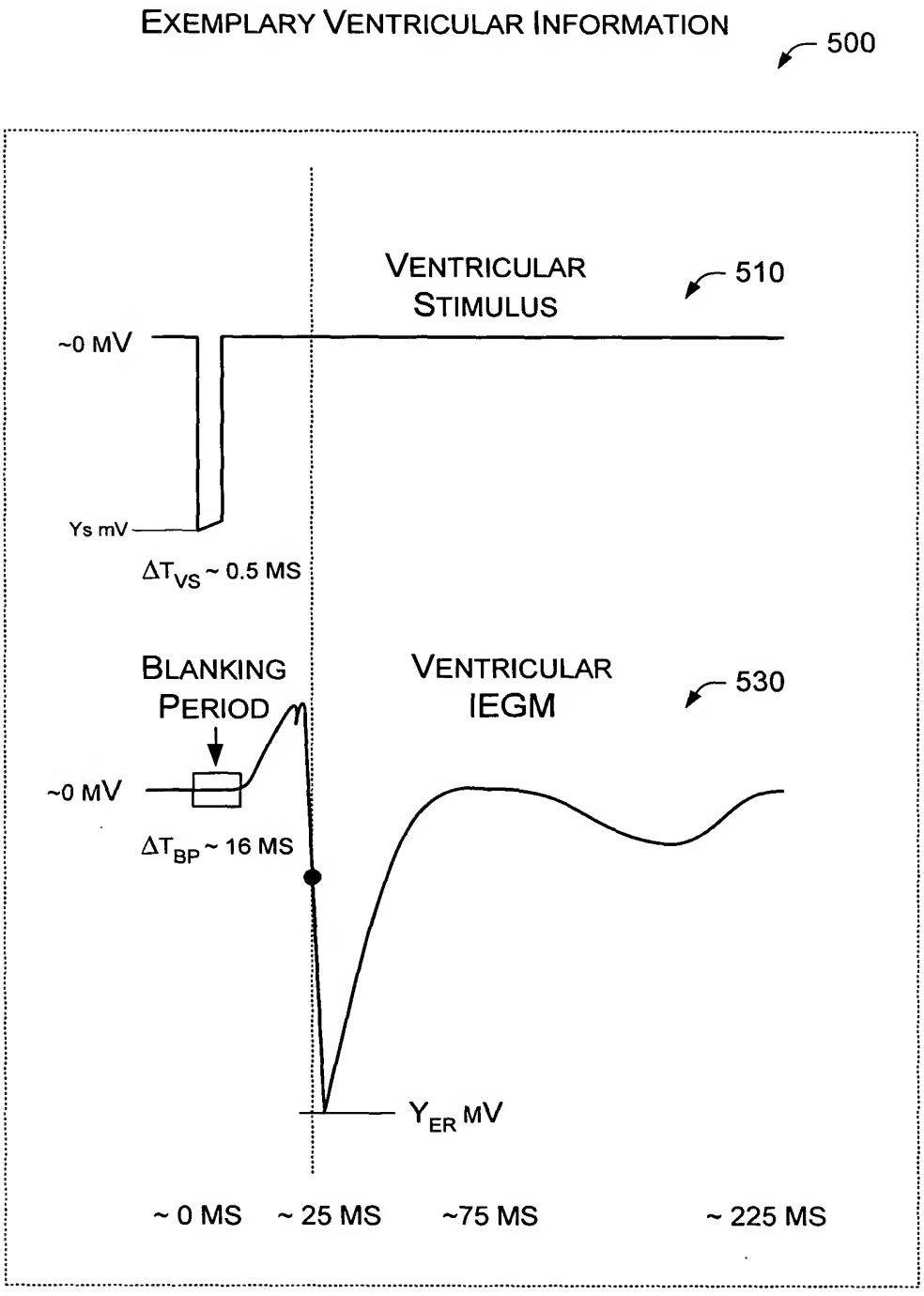
EXEMPLARY VENTRICULAR INFORMATION
500
VENTRICULAR STIMULUS
510
~0 MV
Ys mV
ΔT_{VS} ~ 0.5 MS
BLANKING PERIOD
VENTRICULAR IEGM
530
~0 MV
ΔT_{BP} ~ 16 MS
Y_{ER} MV
~ 0 MS
~ 25 MS
~75 MS
~ 225 MS

Fig.5

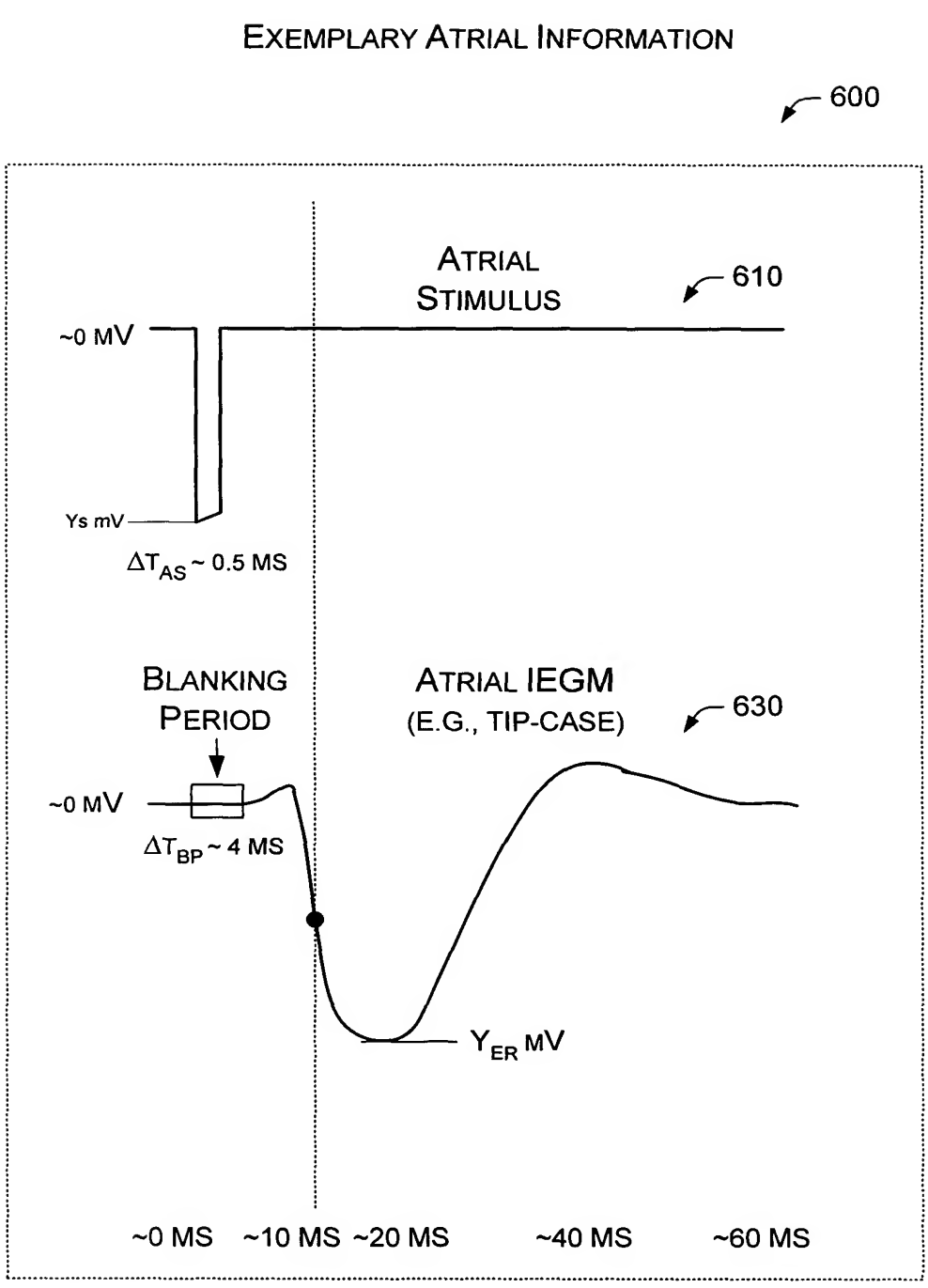
EXEMPLARY ATRIAL INFORMATION
600
ATRIAL STIMULUS
610
~0 MV
Ys mV
ΔT_{AS} ~ 0.5 MS
BLANKING PERIOD
ATRIAL IEGM (E.G., TIP-CASE)
630
~0 MV
ΔT_{BP} ~ 4 MS
Y_{ER} MV
~0 MS
~10 MS
~20 MS
~40 MS
~60 MS

Fig.6

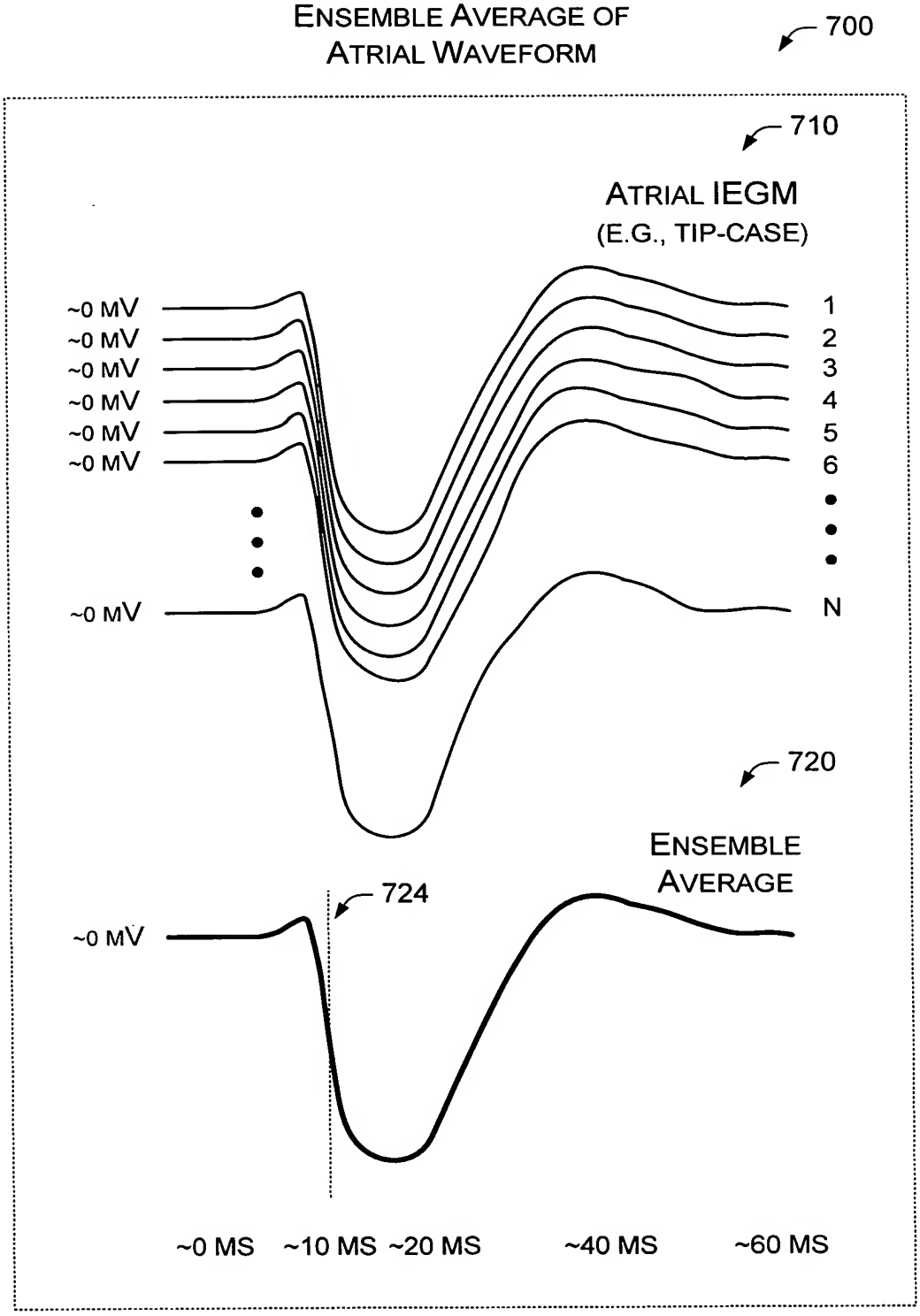
ENSEMBLE AVERAGE OF ATRIAL WAVEFORM
700
710
ATRIAL IEGM
(E.G., TIP-CASE)
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
1
2
3
4
5
6
N
720
ENSEMBLE AVERAGE
724
~0 MV
~0 MS
~10 MS
~20 MS
~40 MS
~60 MS

Fig.7

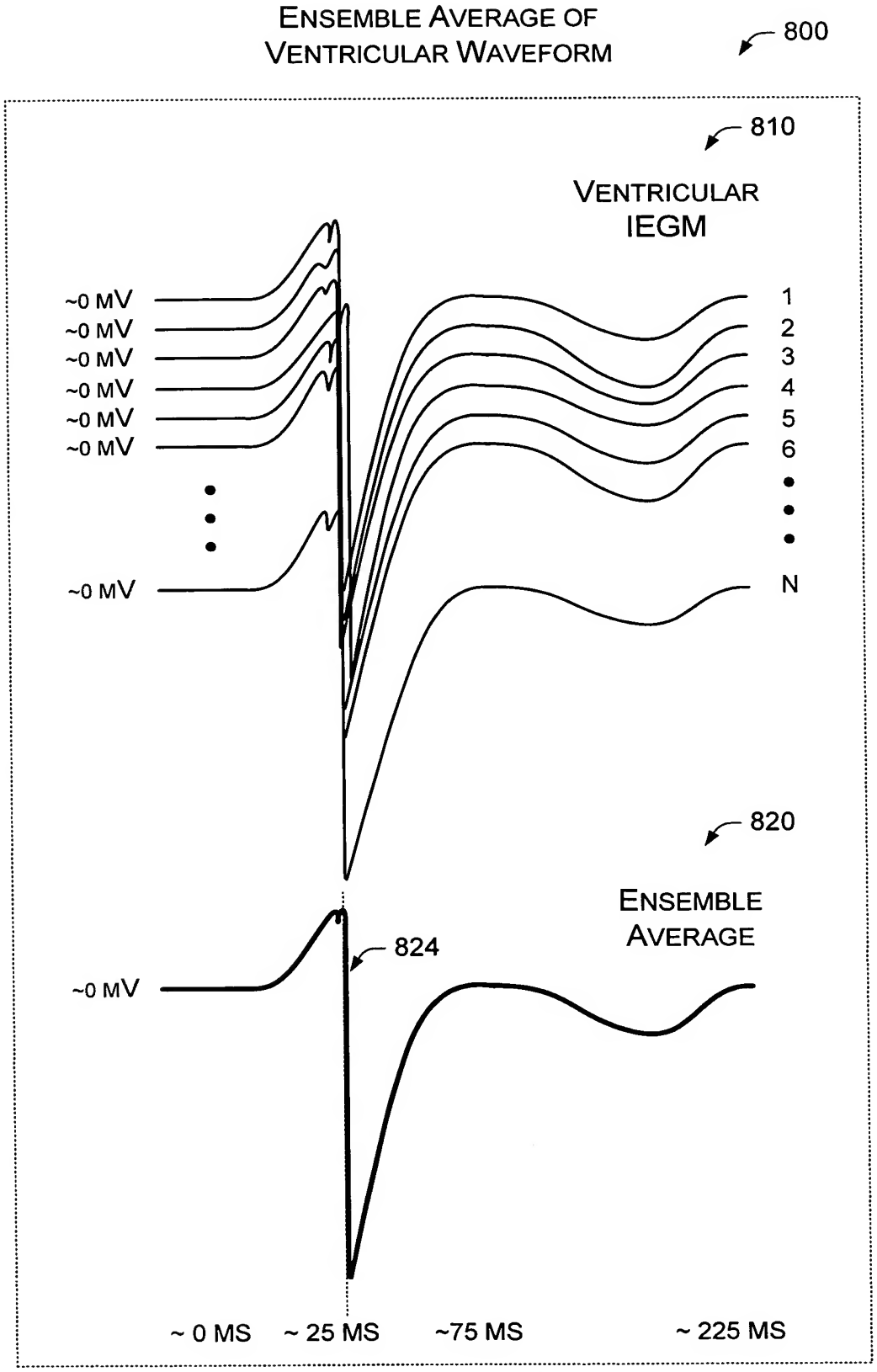
ENSEMBLE AVERAGE OF VENTRICULAR WAVEFORM
800
810
VENTRICULAR IEGM
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
1
2
3
4
5
6
N
820
ENSEMBLE AVERAGE
824
~0 MV
~ 0 MS
~ 25 MS
~75 MS
~ 225 MS

Fig.8

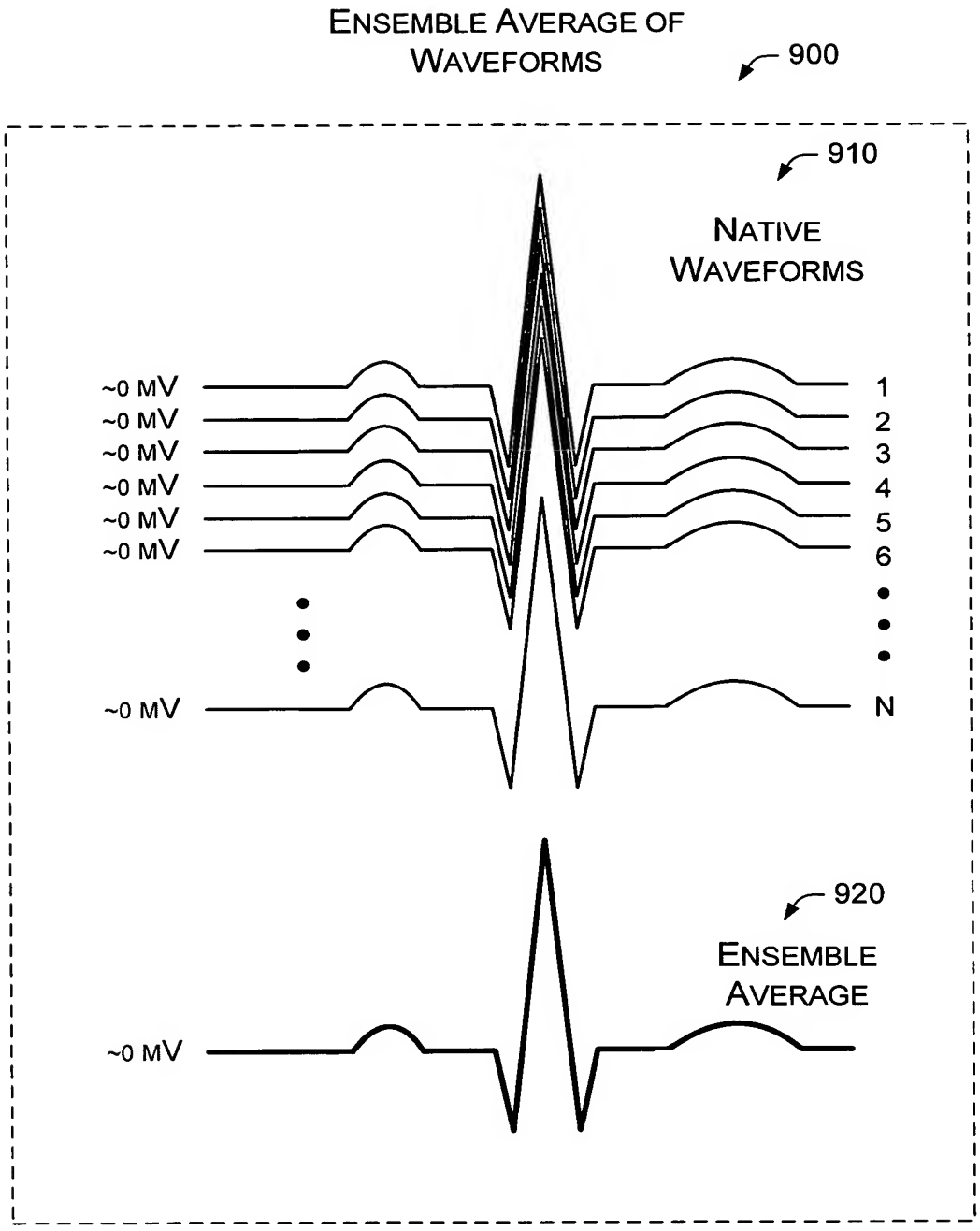
ENSEMBLE AVERAGE OF WAVEFORMS
900
910
NATIVE WAVEFORMS
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
~0 MV
1
2
3
4
5
6
N
920
ENSEMBLE AVERAGE
~0 MV

Fig.9

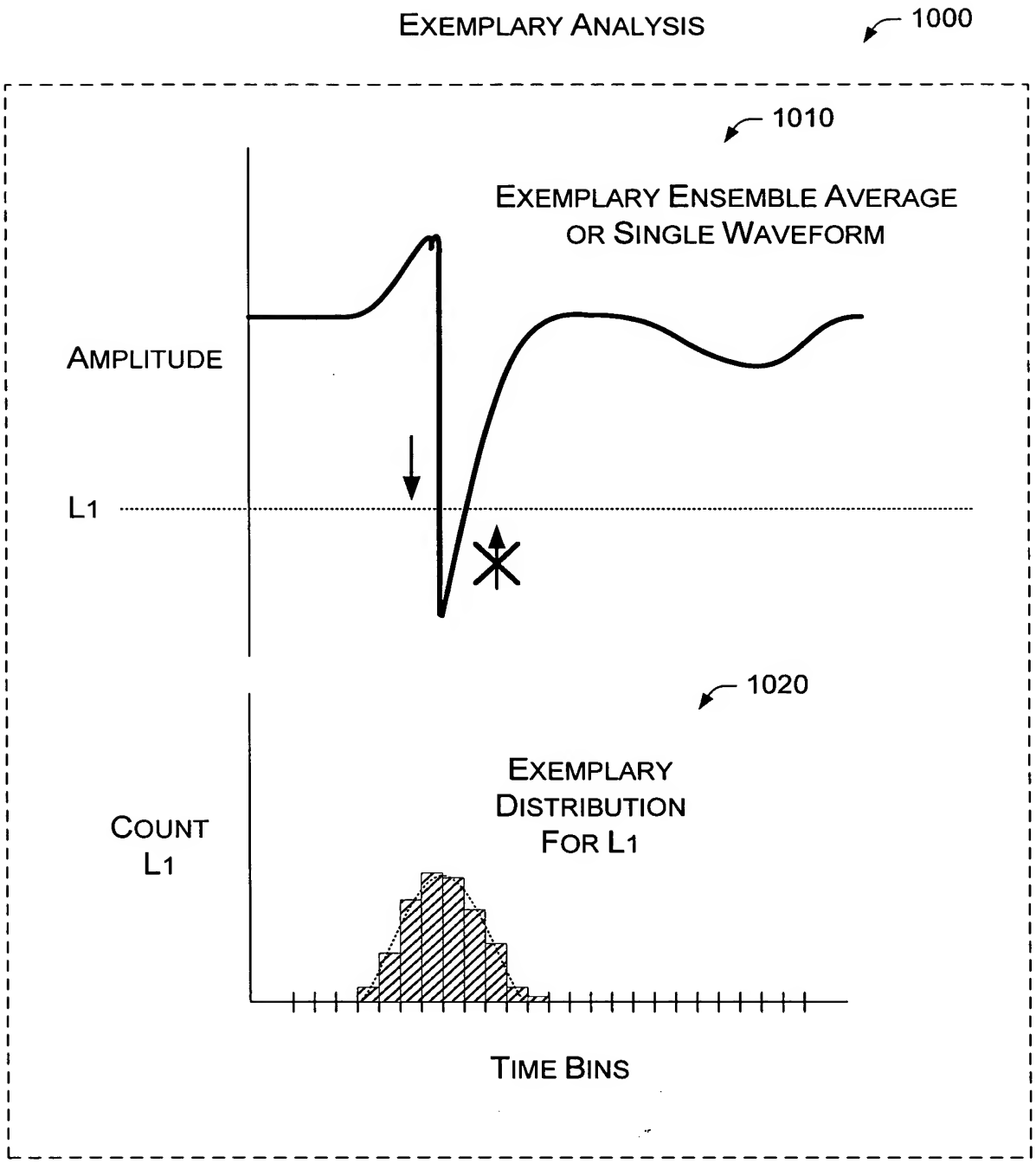
EXEMPLARY ANALYSIS
1000
1010
EXEMPLARY ENSEMBLE AVERAGE OR SINGLE WAVEFORM
AMPLITUDE
L1
1020
EXEMPLARY DISTRIBUTION FOR L1
COUNT L1
TIME BINS

Fig.10

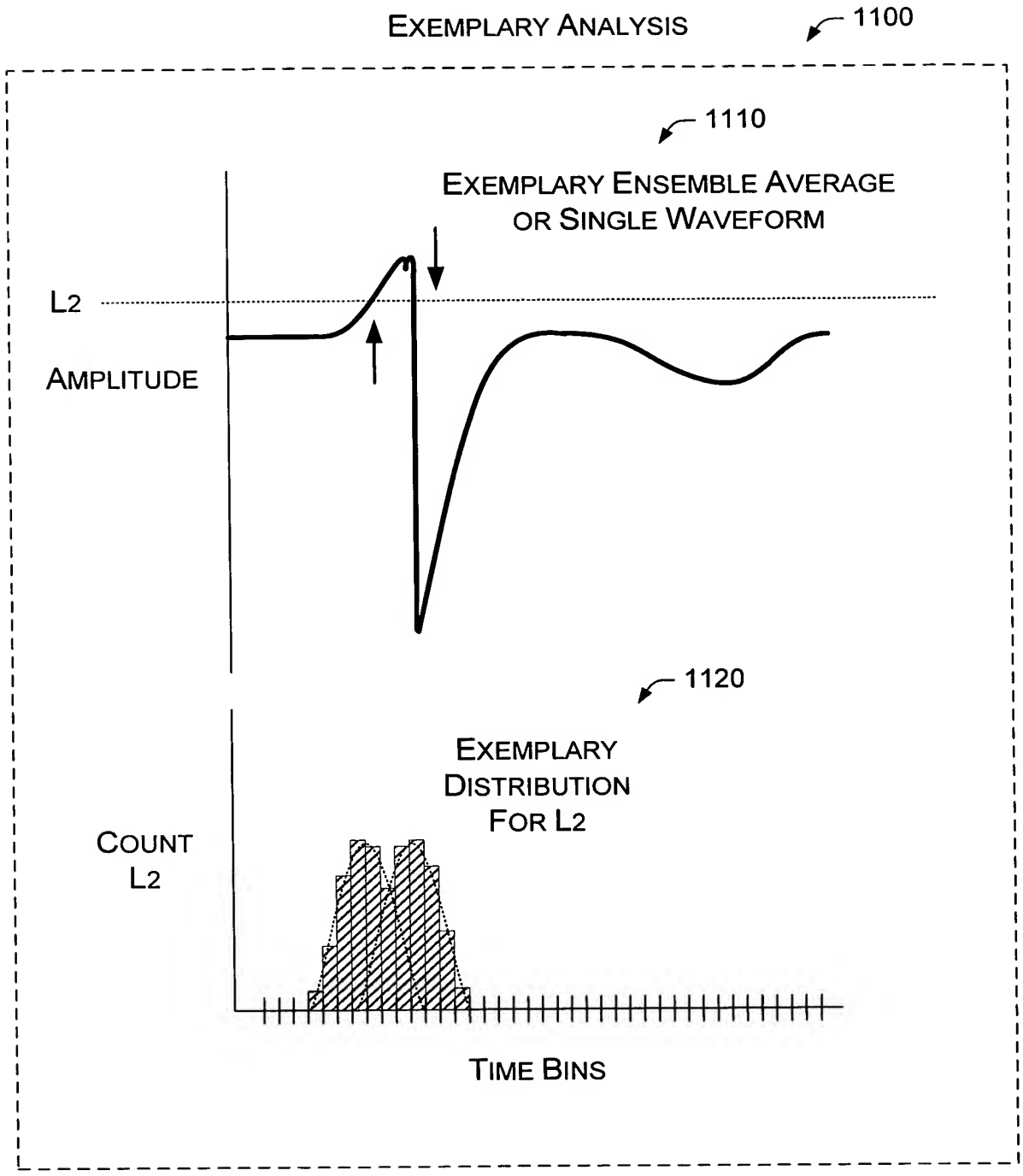
EXEMPLARY ANALYSIS
1100
1110
EXEMPLARY ENSEMBLE AVERAGE OR SINGLE WAVEFORM
L2
AMPLITUDE
1120
EXEMPLARY DISTRIBUTION FOR L2
COUNT L2
TIME BINS

Fig.11

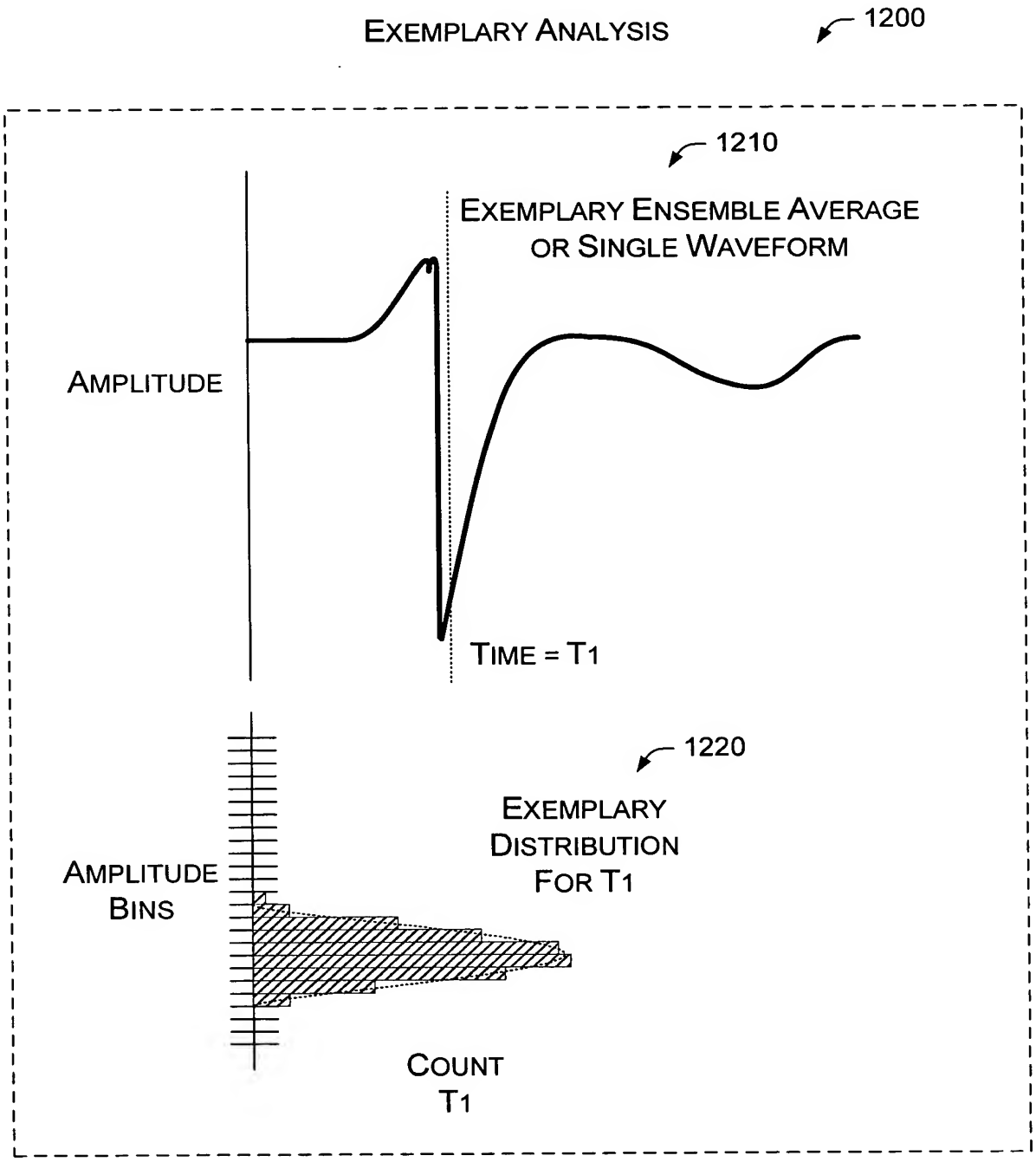
EXEMPLARY ANALYSIS
1200
1210
EXEMPLARY ENSEMBLE AVERAGE OR SINGLE WAVEFORM
AMPLITUDE
TIME = T1
1220
EXEMPLARY DISTRIBUTION FOR T1
AMPLITUDE BINS
COUNT T1

Fig.12

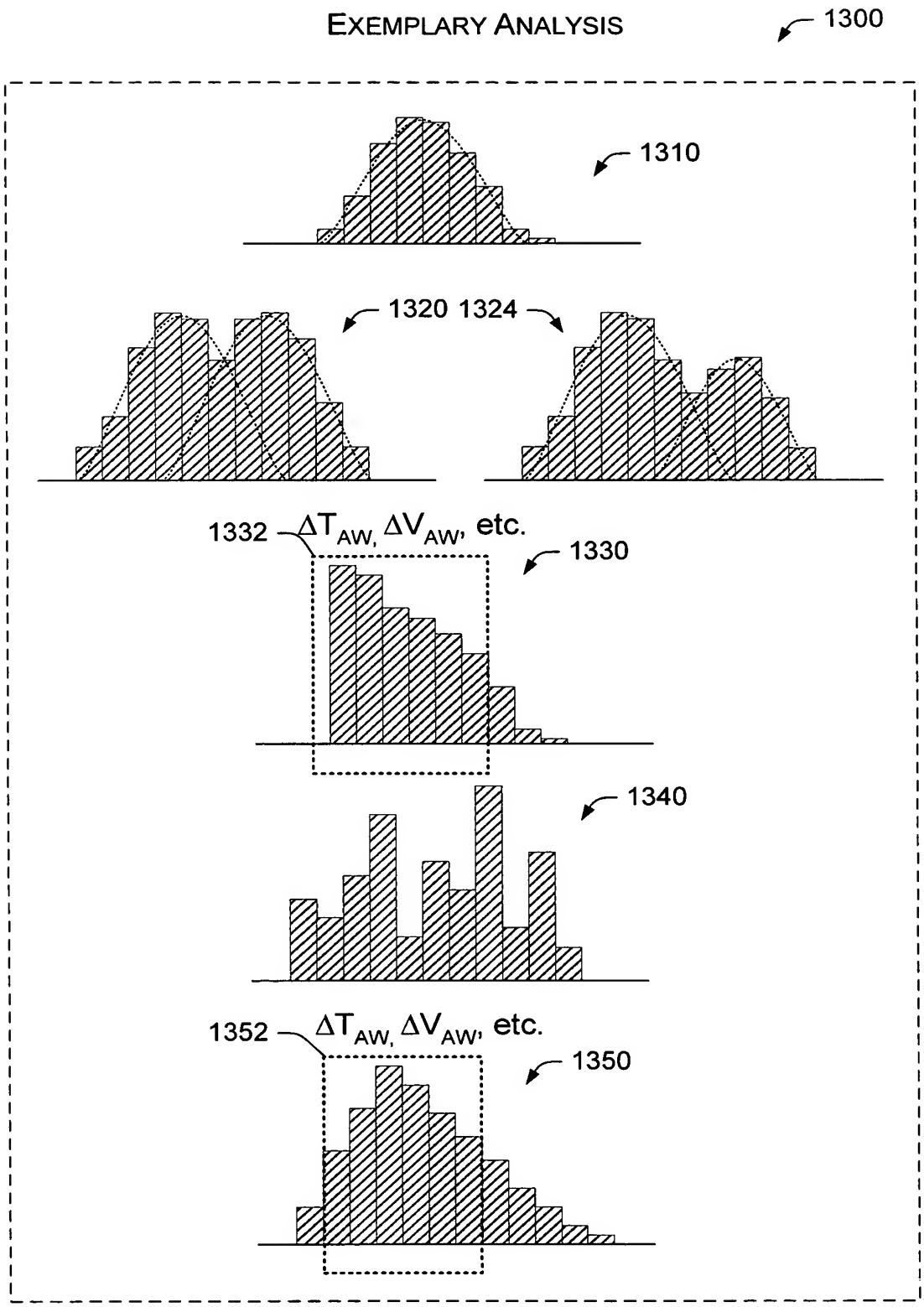
EXEMPLARY ANALYSIS
1300
1310
1320 1324
1332 ΔT_{AW}, ΔV_{AW}, etc.
1330
1340
1352 ΔT_{AW}, ΔV_{AW}, etc.
1350

Fig.13

EXEMPLARY ACQUISITION AND ANALYSIS OF ATRIAL INFORMATION

1400

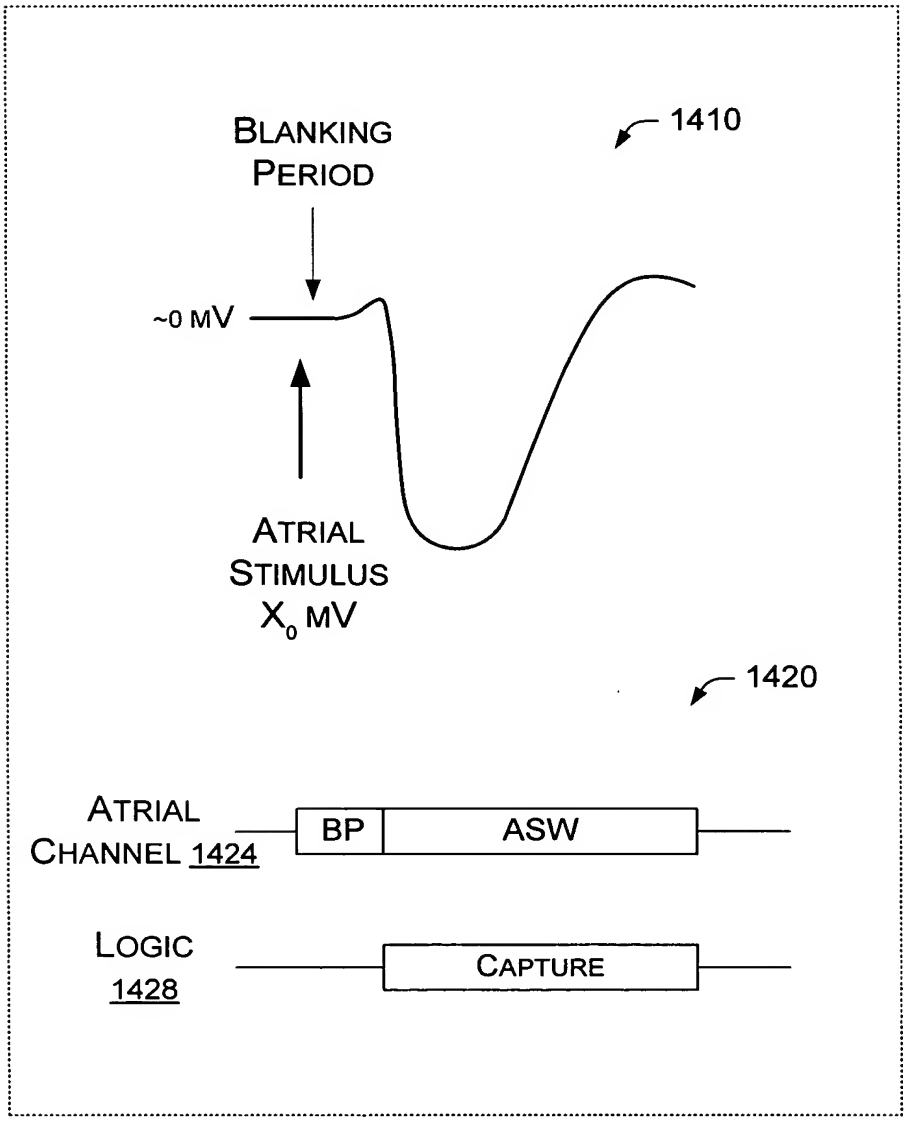

Fig.14

EXEMPLARY METHOD

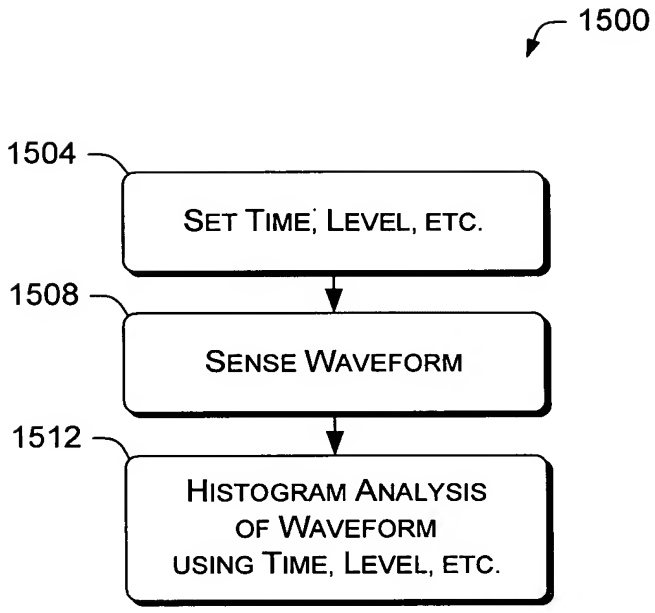

Fig.15

EXEMPLARY METHOD

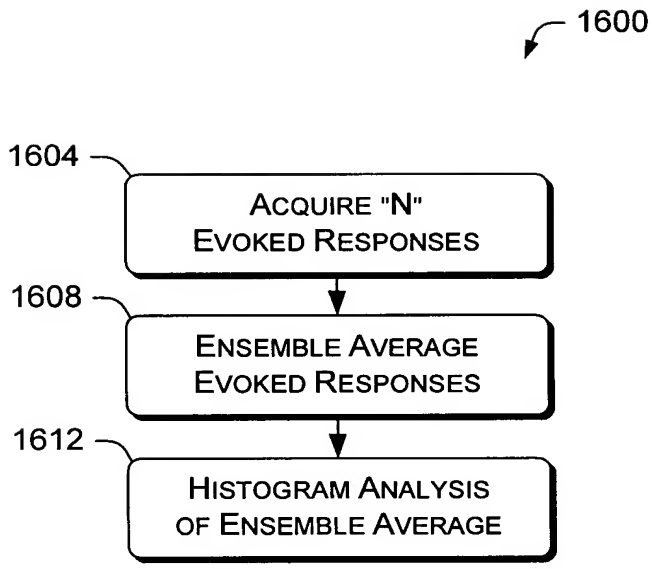

Fig.16

EXEMPLARY METHOD

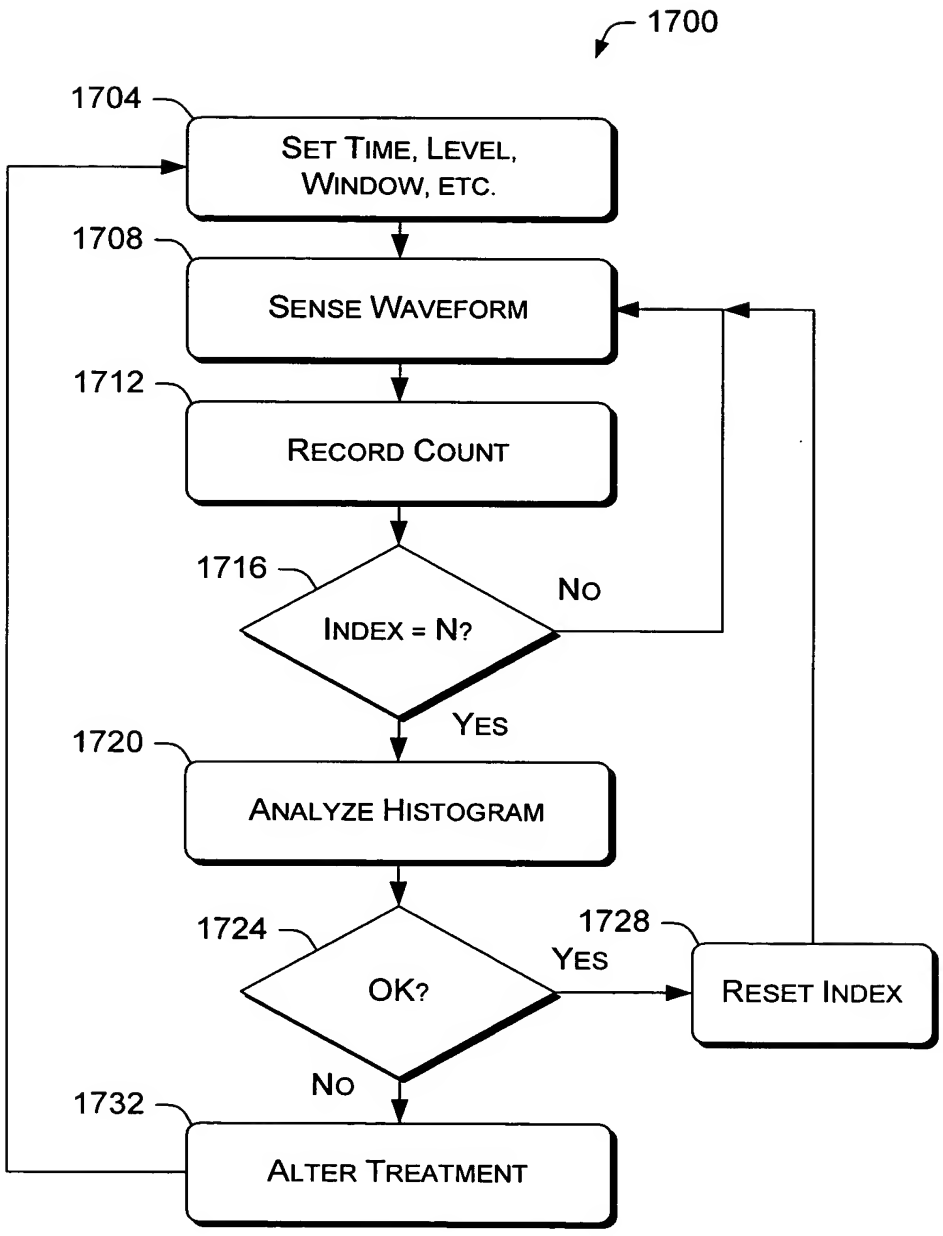

Fig.17

EXEMPLARY METHOD

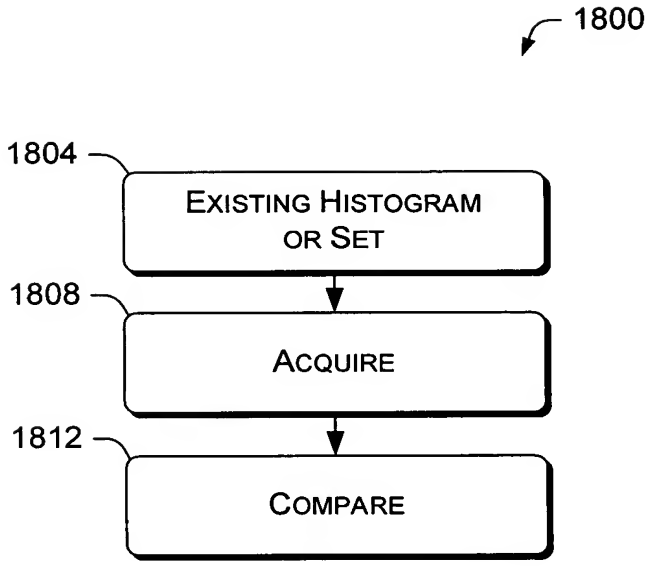

Fig.18

EXEMPLARY METHOD

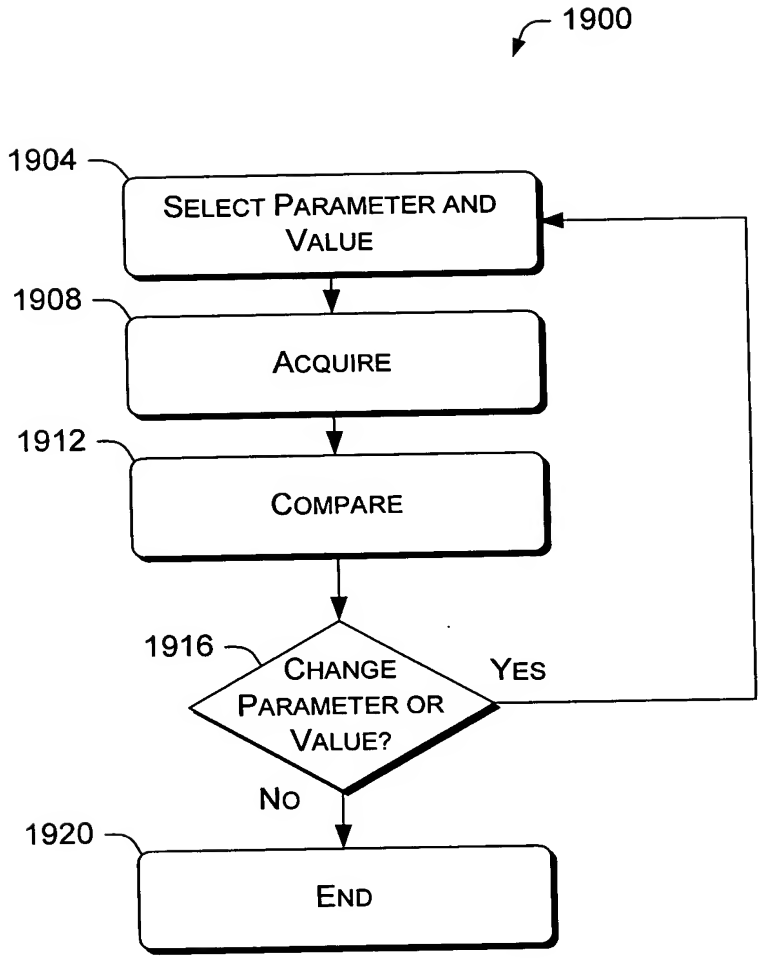

Fig.19